

WHAT IS CLAIMED IS:

1. A switching power supply controller comprising:

5 control signal setting means for setting a control signal on the basis of an output voltage digitally converted in a switching power supply, and a target voltage;

10 current estimating means for estimating an electric current flowing through an inductor of a smoothing circuit in the switching power supply, on the basis of a drive signal for controlling a switching element of the switching power supply, and for generating an estimated current signal;

15 DC component removing means for extracting a DC component included in the estimated current signal estimated by the current estimating means and for removing the DC component from the estimated current signal;

20 DC component resetting means for resetting the DC component extracted by the DC component removing means, every predetermined time; and

25 comparing means for comparing the control signal set by the control signal setting means, with the estimated current signal after the removal of the DC component by the DC component removing means, and for detecting whether the estimated current signal after

the removal of the DC component reaches the control signal.

5           2.     The switching power supply controller according to Claim 1, wherein the DC component removing means comprises:

          a low-pass filter for extracting the DC component from the estimated current signal; and

          a subtractor for subtracting the DC component extracted by the low-pass filter, from the estimated  
10     current signal generated by the current estimating means.

          3.     The switching power supply controller according to Claim 2, wherein the DC component  
15     resetting means feeds a reset signal to the low-pass filter and resets an output from a delay device of the low-pass filter every predetermined time.

          4.     The switching power supply controller according to Claim 1, wherein the predetermined time is an integral multiple of a period of the drive signal.

20           5.     The switching power supply controller according to Claim 1, wherein the current estimating means comprises an up-down counter for counting up every given time on the basis of an up coefficient during an on period of the switching element in the  
25     drive signal and for counting down every given time on the basis of a down coefficient during an off period of

the switching element in the drive signal.

6. A switching power supply controller comprising:

5 drive signal generating means for generating a drive signal to be outputted to a switching power supply;

10 pulse signal outputting means for outputting a pulse signal having a predetermined level value corresponding to an output level of the drive signal generated by the drive signal generating means;

high-pass filter means for removing a DC component included in the pulse signal outputted by the pulse signal outputting means; and

15 integrating means for integrating a signal resulting from the removal of the DC component by the high-pass filter means,

20 wherein the drive signal generating means generates the drive signal on the basis of signals indicating an output voltage of the switching power supply and a target voltage for the output voltage and on the basis of a signal resulting from the integration by the integrating means.

7. The switching power supply controller according to Claim 6, wherein the high-pass filter means is a second or higher-order high-pass filter.

8. A switching power supply controller

comprising:

drive signal generating means for generating a drive signal to be outputted to a switching power supply;

5 pulse signal outputting means for outputting a pulse signal having a predetermined level value corresponding to an output level of the drive signal generated by the drive signal generating means; and

10 calculation means integrally having a function of integrating the pulse signal outputted by the pulse signal outputting means and a high-pass filter function of removing a DC component from the pulse signal,

15 wherein the drive signal generating means generates the drive signal on the basis of signals indicating an output voltage of the switching power supply and a target voltage for the output voltage and on the basis of a signal resulting from calculation by the calculation means.

20 9. The switching power supply controller according to Claim 8, wherein the calculation means is configured based on a transfer function  $H(Z)$  of the calculation means as defined below:

$$H(Z) = 1/(1-b \cdot Z^{-1}) \quad (b \text{ is a coefficient}).$$

25 10. The switching power supply controller according to Claim 8, wherein the calculation means is configured based on a transfer function  $H(Z)$  of the

calculation means as defined below:

$$H(Z) = (1-Z^{-1}) / [(1-b_1*Z^{-1})(1-b_2*Z^{-1})]$$
 (b1 and b2 are coefficients).

11. A switching power supply controller  
5 comprising:

drive signal generating means for generating a drive signal to be outputted to a switching power supply;

10 pulse signal outputting means for outputting a pulse signal having a predetermined level value corresponding to an output level of the drive signal generated by the drive signal generating means;

a first high-pass filter for removing a DC component included in the pulse signal outputted by the pulse signal outputting means;  
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integrating means for integrating a signal resulting from the removal of the DC component by the first high-pass filter; and

a second high-pass filter for removing a DC component included in a signal resulting from the integration by the integrating means,  
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wherein the drive signal generating means generates the drive signal on the basis of signals indicating an output voltage of the switching power supply and a target voltage for the output voltage and  
25 on the basis of a signal resulting from the removal of

the DC component by the second high-pass filter.

12. The switching power supply controller according to Claim 11, wherein the first high-pass filter and the second high-pass filter are first-order high-pass filters.

13. The switching power supply controller according to Claim 6, wherein the drive signal generating means comprises:

comparing means for comparing a signal indicating a difference between the output voltage and the target voltage, with the signal resulting from the removal of the DC component; and

switching means for switching the level of the drive signal from a low level to a high level at a predetermined interval and for switching the level of the drive signal from the high level to the low level on the basis of a result of the comparison by the comparing means.

14. The switching power supply controller according to Claim 8, wherein the drive signal generating means comprises:

comparing means for comparing a signal indicating a difference between the output voltage and the target voltage, with the signal resulting from the removal of the DC component; and

switching means for switching the level of the

drive signal from a low level to a high level at a predetermined interval and for switching the level of the drive signal from the high level to the low level on the basis of a result of the comparison by the comparing means.

15. The switching power supply controller according to Claim 11, wherein the drive signal generating means comprises:

comparing means for comparing a signal indicating a difference between the output voltage and the target voltage, with the signal resulting from the removal of the DC component; and

switching means for switching the level of the drive signal from a low level to a high level at a predetermined interval and for switching the level of the drive signal from the high level to the low level on the basis of a result of the comparison by the comparing means.

16. A switching power supply comprising:

a controller for generating a drive signal for switching control of a switching element by digital control; and

a switching element configured to turn on and off based on the drive signal generated by the controller,

wherein the controller is the controller as set forth in Claim 1.

17. A switching power supply comprising:

a controller for generating a drive signal for switching control of a switching element by digital control; and

5 a switching element configured to turn on and off based on the drive signal generated by the controller, wherein the controller is the controller as set forth in Claim 6.

18. A switching power supply comprising:

10 a controller for generating a drive signal for switching control of a switching element by digital control; and

a switching element configured to turn on and off based on the drive signal generated by the controller, wherein the controller is the controller as set forth in Claim 8.

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19. A switching power supply comprising:

a controller for generating a drive signal for switching control of a switching element by digital control; and

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a switching element configured to turn on and off based on the drive signal generated by the controller, wherein the controller is the controller as set forth in Claim 11.

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